REMARKS/ARGUMENTS

Favorable reconsideration of this application, in light of the following discussion, is respectfully requested.

Claims 1, 4 and 33-41 are pending, with Claims 1, 4, and 33-37 amended by the present amendment.

In the Official Action, Claims 1, 33, 35 and 37-41 were rejected under 35 U.S.C. §112, second paragraph; Claims 1, 33, 35 and 37-41 were rejected under 35 U.S.C. §103(a) as being unpatentable over Gerrish et al. (U.S. Patent Publication No. 2001/0040720, now U.S. Patent No. 6,525,873, hereinafter "Gerrish") and Freund et al. ("Statistical Methods," hereinafter Freund); and Claims 4, 34 and 36 were rejected under 35 U.S.C. §103(a) as being unpatentable over Gerrish and Freund in view of Ye (U.S. Patent No. 6,414,788).

Briefly recapitulating, Claim 1 is directed to

> An optical amplifying method of an optical amplifier connected to an optical transmission line, the method comprising the steps of:
>
> detecting an optical input and output power of said optical amplifier;
>
> obtaining a difference between a target gain and a measured gain of said optical amplifier obtained based on the detected optical input and output power to produce an error signal;
>
> applying said error signal to each of a proportional calculation and an integral calculation to create respective proportional and integral control signals, and adding proportional and integral control signals ***to create a drive current of at least one pump laser diode*** provided in said optical amplifier;
>
> controlling the gain of said optical amplifier with the drive current; and
>
> adjusting a control parameter of the proportional calculator in response to the detected optical input power, said control parameter being a proportional constant by which said error signal is multiplied to form said proportional control signal, ***said proportional constant being represented by a function of the optical input power as a result of the adjusting the control parameter in response to the detected optical input power***.

Claims 33 and 35 are directed to optical amplifiers each reciting a ***proportional constant being represented by a function of the optical input power as a result of the adjusting the control parameter in response to the detected optical input power.***

Applicants traverse the rejection of Claims 1, 33 and 35 under 35 U.S.C. § 112, second paragraph, regarding the indefiniteness of the term 'proportional constant.' MPEP 2106 and 2111.01III note that an applicant is entitled to be her own lexicographer.[1] In particular, the MPEP notes that the "meaning of words used in a claim is not construed in a "lexicographic vacuum, but in the context of the specification and drawings."" *Toro Co. v. White Consolidated Industries, Inc.*, 199 F.3d 1295, 1301, 53 USPQ2d 1065, 1069 (Fed. Cir. 1999). Applicants note that the term "proportional constant" is used throughout Applicants' specification and is defined at least on page 18, line 11 - page 19, line 19, to be determined by a ratio of the resistance R1 of the fixed resistor 19b2 to the resistance R2 of the variable resistor 19b3, as follows: k=R2/R1. The proportional constant adjusting circuit 19f monitors the optical input power through the logarithmic transformation circuit 17 from PD 15, and adjusts the resistance R2 of the variable resistor 19b3 in the proportional circuit 19b in proportion with optical input power Pin In one example of Applicants' invention, the proportional constant adjusting circuit 19f shown in FIG. 8 adjusts the proportional constant k of the proportional circuit 19b as follows: k=A·Pin+B, where, Pin is the optical input power, and A and B are constants. In another embodiment of Applicants' invention shown in FIG. 11, the proportional constant is adjusted in response to the input power to the optical amplifier so that the proportional constant k in FIG. 11 changes (here, stepwise) depending on the magnitude of the input power.

[1] See *In re Paulson*, 30 F.3d 1295, 1301, 53 UPSQ2d 1065, 1069 (Fed. Cir. 1999) (Where an explicit definition is provided by the applicant for a term, that definition will control interpretation of the term that is used in the claim.

Furthermore, Claims 1, 33 and 35 themselves define the term "proportional constant" to be "represented by a function of the optical input power as a result of the adjusting the control parameter in response to the detected optical input power." In view of the definition of the term within the claims themselves, and the definitions and examples provided in the specification, Applicants request the rejection of Claims 1, 33 and 35 under 35 U.S.C. § 112, second paragraph be withdrawn.

Gerrish describes an optical amplifier that uses a proportional plus integral (PI) controller where u(t) represents current or power that controls a laser pump; K_p is a proportional constant of the PI controller; K_i is an integral constant of the PI controller; e(t) represents an error signal (i.e., the difference between a desired value for a gain or output power given a set point).[2] However, as acknowledged by the Official Action, Gerrish fails to disclose or suggest a "***proportional constant being represented by a function of the optical input power as a result of ... adjusting the control parameter in response to the detected optical input power***." To cure this deficiency, the Official Action applies Freund.

Freund describes various statistical methods, including a discussion of the role of assumptions on modeling. However, Freund does not disclose or suggest a "***proportional constant being represented by a function of the optical input power as a result of ... adjusting the control parameter in response to the detected optical input power***." Indeed, Freund does not disclose or suggest any type of optical amplifier control, let alone Applicants' claimed proportional and integral control, where a proportional control signal is adjusted by adjusting a control parameter (i.e., a proportional constant represented by a function of the optical input power) in response to the detected optical input power. Freund briefly discusses on page 239 the need to verify a model if an assumption is violated. However, the model verification is not applicable to Applicants' claimed invention. Freund

[2] ~~Garrish~~Gerrish, paragraphs [0021]-[0026].

Freund describes that the model verification is subjective, does not involve any formal statistical analysis, and therefore should be performed by an expert. However, in Applicants' claimed invention, no expert is involved in adjusting the claimed control parameter. Instead, a specific feedback algorithm is used, independent of human involvement. Applicants cannot understand the relevancy of Freund to Applicants' claimed invention.

Furthermore, the fact that Gerrish uses a ***fixed*** proportional constant (by which the error signal is multiplied to form the proportional control signal) and Applicants' claimed invention uses proportional constant that is adjusted in response to the detected input optical power (e.g., gain adjusting circuit 19f in FIG. 6) is a non-trivial difference because using Applicants' proportional constant significantly improves the performance of the optical amplifier apparatus in terms of operation stability and transient behavior. Details concerning this improvement follows.

FIG. 4 of Gerrish shows a curve called "threshold for oscillation," where a region below the curve corresponds to where optical amplifier operations are stable, while a region above the curve corresponds to where the optical amplifier is unstable (i.e., the amplifier output can oscillate). Also shown in FIG. 4 of Gerrish is a curve called "gain required to obtain appropriate transient characteristics," where a region below this curve defines where a transient response of the optical amplifier is unsatisfactory (i.e., the optical amplifier output undergoes a large temporary change before the output is settled when responding to a sudden change in the amplifier input power (e.g., step change as seen in FIG. 15)). The region above the curve defines where the transient response of the optical amplifier is satisfactory. That is, the optical amplifier has a reduced transient behavior in the region above the curve "gain required to obtain appropriate transient characteristics."

In FIG. 4 of Gerrish, a fixed horizontal dotted line "SET GAIN" indicates the use of a fixed proportional constant, which is denoted by k0. In the optical input power vs. gain

graph of FIG. 4, the proportional constant given by the line "SET GAIN" corresponds to a region where the optical amplifier operates. It can readily be seen from FIG. 4, that the optical amplifier operations are unstable when the input power is low ("optical input range of oscillation" in FIG. 4.)

Further, it can readily be seen from FIG. 4 of Gerrish, that the optical amplifier has an unsatisfactory (i.e., large) transient response when the input optical power is high ("optical input range of inappropriate transient response" in FIG. 4.) The large transient behavior that is inherent in Gerrish is not present with Applicants' claimed invention at least because Applicants' proportional constant is adjusted in response to the detected optical input power.

As noted above, non-limiting examples of the optical amplifier operation using a variable proportional constant as a function of the input optical power are illustrated in Applicants' FIG. 8 and FIG. 11. As seen in the optical input power vs. gain plane of Applicants' FIG. 8, the optical amplifier apparatus operates within a region between the curves "threshold for oscillation" and "gain required to obtain appropriate transient characteristics or response," ***irrespective of the magnitude of the input optical power to the amplifier***. This is because the proportional constant ***varies*** as a function of the input optical power. In FIG. 8, the proportional constant is denoted by k which is given by $A \cdot P_{in}+B$, where P_{in} represents the optical input power, and A and B each represent a constant (i.e., fixed value). Alternatively, in Applicants' FIG. 11 the proportional constant is adjusted in response to the input power to the optical amplifier so that the proportional constant k in FIG. 11 ***changes*** (here, stepwise) depending on the magnitude of the input power.

Gerrish does not acknowledge the problems detailed above, let alone provide the solution recited in Claims 1, 33 and 35 (i.e., adjusting a proportional constant in response to the detected optical input power.)

Applicants have considered Ye and submit Ye does not cure the deficiencies of Gerrish and Freund. As none of the cited prior art, individually or in combination, disclose or suggest all the elements of independent Claims 1, 33 and 35, Applicants submit the inventions defined by Claims 1, 33 and 35, and all claims depending therefrom, are not rendered obvious by the asserted references for at least the reasons stated above.[3]

Furthermore, In KSR v. Teleflex (127 S. Ct. 1727, 1740 (2007)), the Court noted that "[u]nder the correct analysis, any need or problem known in the field of endeavor at the time of invention and addressed by the patent can provide a reason for combining the elements in the manner claimed." The Court also noted that "a person of ordinary skill has good reason to pursue the known options within his or her technical grasp. If this leads to the anticipated success, it is likely the product not of innovation but of ordinary skill and common sense. In that instance the fact that a combination was obvious to try might show that it was obvious under §103."

However, the Court went on to note that "rejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some ***rational*** underpinning to support the legal conclusion of obviousness."

Here, however, the Official Action provides an irrational reason, apparently based on hindsight reasoning, for modifying the controller of Gerrish to use Applicants' claimed a "***proportional constant being represented by a function of the optical input power as a result of ... adjusting the control parameter in response to the detected optical input power***." That is, the model verification of Freund is not relevant to Applicants' claimed invention. Thus, for another reason, Applicants request that the present rejection under 35 U.S.C. § 103(a) be withdrawn.

[3] MPEP § 2142 "...the prior art reference (or references when combined) must teach or suggest **all** the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. In re Vaeck, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991)."

Accordingly, in light of the previous discussion, Applicants respectfully submit that the present application is in condition for allowance and respectfully request an early and favorable action to that effect.

Respectfully submitted,

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